Securing Our Water Supplies – The Challenge of Water Quality Monitoring in the Small Island Developing State of Barbados

by

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INTRODUCTION

- In Barbados, like many countries in the world, water quality monitoring has its challenges which are dictated by nature and man's activities in the aquatic, terrestrial and atmospheric environments.

  Within international perspectives, international standards and practices are used in monitoring within the concepts of integrated water resources management to sustain potable water attributes, despite being classified as a water scarce country regionally, and internationally.

Barbados Location

- Latitude 13N Longitude 59W
- Atlantic Ocean on eastern coast
- Caribbean Sea on western coast
- Coastline 97 km
- Small coral limestone island
- 34 km (21 miles) long
- 23 km (14 miles) wide at widest part
- Total Area 432 square kilometres

Geology

- 85% coral limestone Pleistocene Age
- Remainder eroded limestone exposing oceanics of Eocene Age, called the Scotland District
- Top soil varies from outcrop to over 10 metres(30 feet)
- Coral cap over 91 metres (300 feet)
- Highest point 337 metres (1116 feet)

Water Sources

- Groundwater only: wells and springs
- Small streams originating from springs
- Rainfall 1524 mm (60 inches) av. Annual
- 75% in wet season May –December
- Hurricane season June to November
- Estimated Yield: wet year 50 mgd
  dry year 30 mgd

Available Water

- Groundwater 44.57 mgd
- Surface water 6.60 mgd
- Runoff 3.50 mgd
- Spring 0.32 mgd
- Wastewater 1.20 mgd

TOTAL 56.19 mgd

Water Consumption

Year 2002 :- 50.39 million cubic metres

Potable water consumers listed (2002): - 94 652

WATER EXTRACTION USERS

Barbados Water Authority	160.0	ML/day
Industrial	7.1	ML/day
BADMC/BAMC irrigation	3.6	ML/day
Private Agriculture irrigation	1.4	ML/day
Golf Courses	2.5	ML/day

ML/day ------ mega litres per day

BADMC-Barbados Agricultural Development& Marketing Corporation
BAMC- Barbados Agricultural Management Company

FRESH WATER QUALITY

- Quality of potable water has met International Standards and Guidelines.

Parameter mg/L	Barbados ave.	WHO Potable	Internat'l Standard
Nitrates-N	7.1		10
Chloride	112.6	250	250
Sodium	50.26	200	200
Sulphate	33.5	400	250-400
pH	7.6		8.5
Faecal Col.	<1/100		<1/100
Atrazine	0.46		3.0
Ametryne	0.13		3.0
TDS	426		500

CHALLENGES of PHYSICAL FEATURES

- Physical Features of Coral Limestone:

- Fissures, Gullies, sink holes, caves
- Abandoned limestone quarries.
- Unconfined aquifer - easy to contaminate
  - sea water intrusion

These conditions give rise to direct mobility of contaminants into the subsurface environments of soil and aquifers.

CHALLENGES OF POPULATION

- Resident population (2002) 271300
- Population density 628 persons per square Km
- High demand for urban and rural housing
- Added Tourism Population
  Tourism arrivals 400 – 50 000 annually
- Industrial and Office Complexes
- Use of termiticides for building protection

65 % of population within 2Km of coastal corridor on west and southwest coast.

CHALLENGES of WASTE DISPOSAL

Coastal and inland aquifer vulnerability to:

- Solid waste disposal
- Waste water
- Household and industrial chemicals
- Sewage
- Bulk waste
- Petrochemicals
- Hazardous waste

Indiscriminate and illegal dumping of the above

CHALLENGES of AGRICULTURE

- Diversification: sugar, crops, livestock

Point pollution due to agrochemicals, solid waste, nutrients.

Point pollution give rise to diffuse pollution using:

- Pesticides:

  insecticides, herbicides, fungicides

  rodenticides,, molluscides, termiticides,

  nutrients(fertilizers)

SECURING THE SUPPLIES
INTITUTIONAL MONITORING FRAMEWORKS

- The Organizations collaborate with the Labs.

1)Barbados Water Authority : management of potable water , sewerage.

2)Ministry of Agriculture (MAR),Barbados Agricultural Development Corporation, Barbados Agricultural management Company:

irrigation water

3) Ministry of Physical Development and Environment.

4) Laboratories:

Analytical Services (MAR),

Testing Laboratories (Ministry of Health)

SECURING THE SUPPLIES
WATER PROTECTION ZONES

- Water Control Act 1953
- Ground Water Protection Zone Policy 1963

(does not take into account chemical movement)

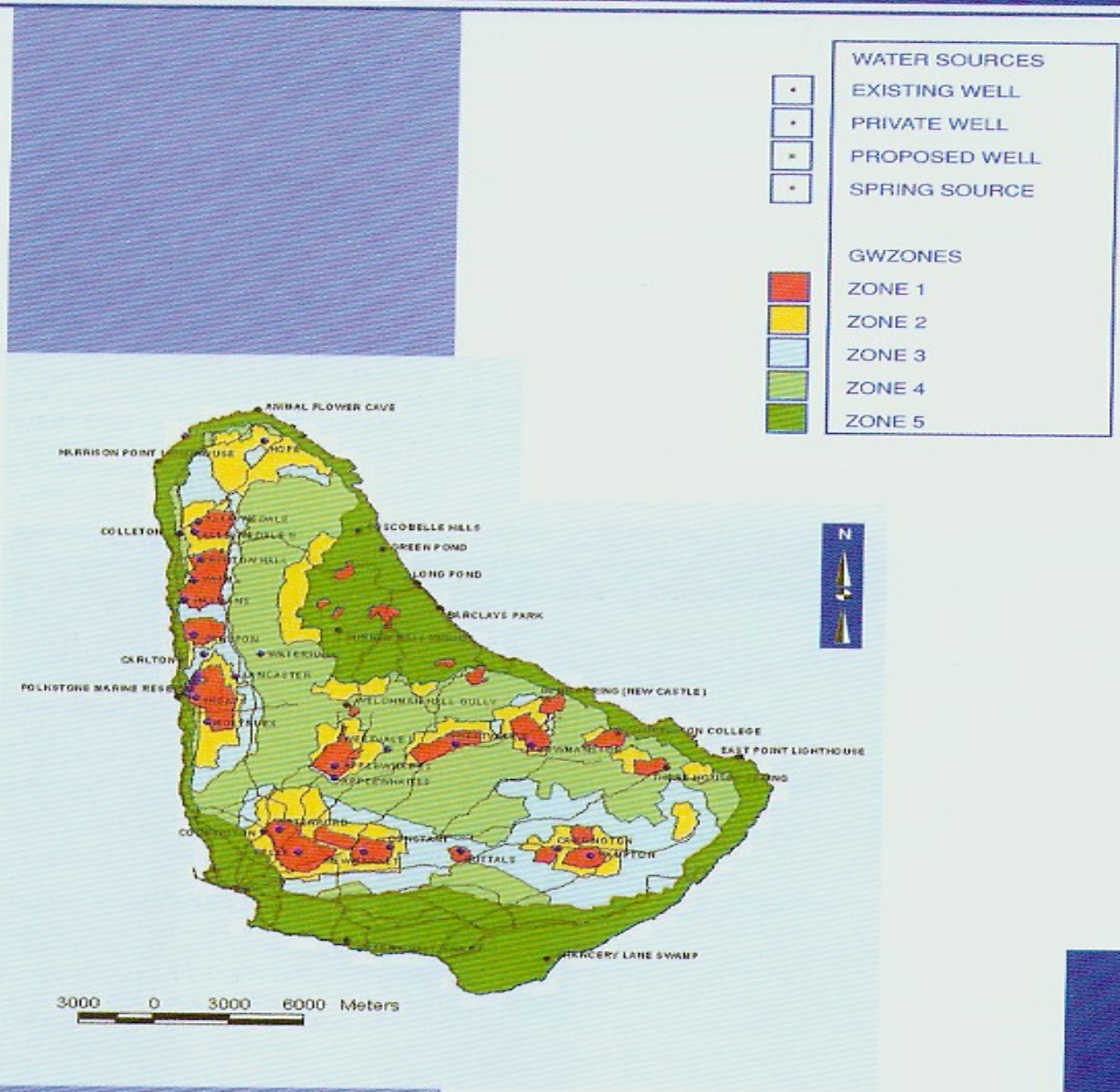
- Five Zones established on time of travel of bacteria to potable water well and spring.
  - Zone 1: 300 days, no new housing
  - Zone 2: 600 days, septic tank, wells*
  - Zone 3: 5-6 years, septic tank, wells*
  - Zone 4 and Zone 5: no restriction.

Well for kitchen ; Well for toilet and bath

- Bridgetown, South Coast and *West Coast Sewerage Projects introduced to assist this.

* At design stage

Map 5.3: Ground Water Zones, Wells & Springs



Source: The National Natural Resources Data Base, 1998.

SECURING THE SUPPLIES
PESTICIDE CONTROL BOARD

Pesticide Control Act of 1974

- Regulates the approval of imported pesticides.
- Banning of non-approved pesticides.
- Issuing of licence to import
- Training courses (use,abuse,storage)
- Preparation of Pesticide Control Regulations

Members drawn from:

Govt. Dept: Agriculture, Health, Government Analyst, Environment

University.

SECURING THE SUPPLIES
WATER MONITORING STRATEGIES

Physical, Biological and Chemical Monitoring:

- Frequency: monthly,weekly some sources
- Date: determined in consultation with labs.
- Sources: well, distribution system, springs,
  existing boreholes.

Introduction of instrumentation for real time date acquisition

New boreholes are being established
rehabilitation of past boreholes

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SECURING THE SUPPLIES
LAND USE CONTROLS

- Physical development planning:
- Location of :
  - Housing
  - Hotels
  - Industry
  - Petrol stations,
  - Crop and Livestock enterprises
  - Commercial properties
  - Landfills
  - Waste disposal sites.
  - Golf courses

SECURING THE SUPPLIES
KEEPING ABREAST

- Updating Laboratories:
  equipment, tests,
  quality assurance and control
- Implement standards and guidelines.
- Public education and awareness
- Introduction of chemical use records for type, rates, application date and time.
- Use of desalination plants.

CONCLUSION

- Given its international and regional status of a high ranking water scarce country of 307 cubic metres per capita per year, the issue of long term water quality monitoring is therefore critical.
- This long term monitoring must envisage appropriate protection from physical, biological, and chemical pollution in order to achieve sustaining successful acceptable water quantity and quality in the Island of Barbados.